



William Harold Butterfield

# Making fences, walls and hedges

Bishop Burton College



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# Making fences, walls and hedges

William Harold Butterfield

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**Author: William Harold Butterfield**

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# MAKING FENCES WALLS AND HEDGES

*By* W. H. BUTTERFIELD



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A modern gate of simple but good design.  
Quite in character with the house.





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A MODERN GATE OF GOOD DESIGN

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## INTRODUCTION

UNDOUBTEDLY the first use of fences and walls was for protection, primarily against the mighty beasts that threatened our earliest ancestors and later to secure the crops and domesticated animals. They helped to stop the encroaching forests and jungles, acted as wind breaks to delicate plants or to habitations and finally served as boundaries to property controlled by the family or community. As the home became an institution and men gathered in favorable locations for mutual protection and social intercourse, the fence acted as a screen or barrier to the private life about the house. All walls and fences, no matter what their use, can be made ornamental and their proper use, however simple, but employed with feeling and discernment for the architecture of the house and for the nature of the land, stamps the property at once with a personal touch.

An important use of fences and walls, more appreciated in Europe than here, is support for vines, fruit trees and other crawling plants. In England it is quite necessary to ripen some fruits, such as peaches, against walls. The additional sunshine and the heat radiated from the wall are responsible for the complete ripening of the fruit in a cool, damp climate.

As in all other matters of designing, that is designing accessories for the house, the same principles apply for these features. Appropriateness of style with the house, relation of color and proportion, surface texture and the like; all these are important considerations. They are the connecting links between the purely natural features of the grounds or garden and the conventional and artificial features of the building. They are the shadings of expression between the formality of the house and the formality of the garden or the informality of the grounds.

## I

# FENCES AND THEIR CONSTRUCTION

**I**F the line of boundary, whether a fence, a wall or a hedge is placed at the border of your property with that of some one else, it is well to consult the law as to what constitutes a "legal fence." The various States have their own laws. They govern the height and the material and proclaim usually that each party to a boundary shall maintain his half, consequently you have no control over the portion which does not face your land. If you wish complete control of the fence or wall, it must be entirely on your property. The above points might be kept in mind when determining the form your boundary line is to take.

Fences are usually of wood, iron, wire or their combinations. The commonest form of fence, pure and simple, is of wood. This is very natural as wood is our easiest



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worked material and comes in convenient shapes and sizes. Early forms of wood fences are the snake, split rail and stump. Later came the dressed rail and the board and picket fence and such elaborate types as are seen on large formal places, where lattice work, balustraded fences, hoop fences and many with combinations of the above, occur.

The best we can say about the snake fence is that it is picturesque, which is another horribly misused word. Yet when used to border an old pasture or encircle a wood lot, the snake fence fits into its surroundings so well that we are apt to forgive it its faults, for it surely has some. It is not a permanent type and as it is only used for economy and speed of construction it can be dismissed from the remainder of these pages.

The more usual forms of wood fences are board and picket. They are simple in construction, the members consisting of boards or pickets secured to horizontal members which are in turn supported by uprights in the ground. The most important member is the upright. The



A Colonial example. The lines of the fence and of the house are in perfect harmony. The vertical lines of the trees add no small part to the composition.



others are easier to renew and cheaper to procure, therefore care is taken to use wood that is least affected by contact with earth. Of the common woods for this purpose, locust and chestnut are the best. The more seasoned the wood is the better and to insure longer life the ends in the ground can be treated, in fact all wood coming in contact with the earth should be treated for preservation. Charring is one way. The end is held over a fire until it is well blackened — both the tip and the sides to a point above grade. Other methods of preservation are peeling and seasoning and painting.

Surface brush painting, while not durable, is often resorted to and consists in applying white-wash, petroleum, tar creosote and coal tar creosote. Creosote is the best when put on hot in two or more coats. Paint the tops as well as the butts. As the brush work does not enter far into the wood, better results are obtained by dipping the ends into the liquid, this however takes more material but less labor.

Impregnate with creosote by heating the

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wood and allowing it to cool in the mixture. Have the temperature of the wood over 200° F. so that the air and water will be expanded and forced out and when cooling begins, the vacuum which occurs sucks in the creosote.

Whatever method is employed, carry the treatment above the ground line as at this point the surface is exposed to more frequent conditions of dryness and dampness. It is due to these constant changes that wet-rot sets in. Notice any wooden post that is decaying and you will see just at the ground line a deeper area of corrosion. Grade the earth away from the post. Water should not be allowed to stand or collect on or near any woodwork, therefore it is well to bevel the tops of the posts and rails so that rain will quickly run off. Posts of old fences sometimes were set on large stones level with the ground, and secured to them by iron dowels.

The posts are best when set three feet in the ground and eight or ten feet apart. The quickest, cheapest form is to nail the rails to the posts and the pickets or boards



to the rails. Of course galvanized nails should be used. A better way is to let the rails into the posts, either at the sides or through the center and bolt them, while a still better way is to continue by cutting out holes in the rails and passing the ends of the pickets through them. Then when all are nailed you have a stouter fence. However, in this case it is not quite as easy to renew a broken picket or a split rail. For a cheap fence four by four inch posts, two by four rails and pickets seven-eighths of an inch square two inches apart may be used but it is much better to have the posts at least six by six and the pickets one inch or one and one-eighth inches square. At times when a lightness and grace of design is desired the smaller size pickets are used.

An interesting fence is often made by using boards of random widths placed vertically to the rails. These boards vary from three to six inches in width and often the tops are cut in uneven lines or follow a curve from post to post as shown in Fig. 1.

There is a form of tight board fence

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that is occasionally used and one that does not allow the joints between the boards to



Uneven boards of random widths from three to six inches, if the tops are cut in uneven lines, make an attractive fence

open up (see Fig. 2). The boards, while set vertically, are lapped in the same way as siding or clap boards on the walls of a



Boards less than one inch in thickness, fastened vertically to the rails and lapped as are clapboards, make a satisfactory tight fence

house and they are nailed where they lap so that each board is held firmly to the

next and to the rail. Use for these, boards not less than one inch in thickness.

If you have a broad expanse that you do not care to have broken by the line of a fence, a sunken fence can be used which is merely an ordinary fence set in a hollow. This depression or little valley should have sides steep enough to shut off a view of the fence, but at the same time not so steep but verdure will grow. (See Fig. 3.)



A fence set in a hollow is concealed where an unbroken expanse is desirable

It is evident that unless this form is used where this is good natural drainage this valley would become at times a river or possibly a swamp.

The fences spoken of above are simple both in design and in construction yet it is surprising what pleasing and charming effects result from a careful study of the relation of one member to another, that is to say, their proportion. The spacing of the pickets or boards has also much to

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do with the final appearance. In general where slender members are used (as pickets) the distance between or the void should be somewhat larger than the width of the vertical piece, while in the case of boards, the void, if made less than the board itself, gives a solidity appropriate to this particular type.

You will find occasionally in some country districts a peculiar type of fence, or rather a giant hedge, which has been formed by cutting and bending young trees. This bending is done near the ground and trees have been selected or planted to form the line desired for the boundary. As the trees grow the main trunks a few feet above ground are horizontal and the branches grow up vertically from them while vines and bushes use the trees thus deformed for supports, the whole making an almost impenetrable mass and an effective barrier. The inquisitive rambler has marveled when coming across a pasture or field to see, standing out alone and grotesquely what might have been a noble and upright member of the forest, but now crippled and crushed,

an object of derision and humorous wonderment. Long ago that tree, now a pathetic sight, was part of a "live fence" in which many of his brothers were maltreated in the same fashion. The rest being cleared away, as the land was used for other purposes, he, by some chance or whim, was left a mournful relict of a long forgotten boundary.

When we come to fences of a more decorative character an almost unlimited number of forms are encountered. The first step beyond the common picket and board fence is one where pickets are still used but the post is treated more elaborately; usually with architectural members. That is it has a base, shaft and cap. If classical in spirit, the accepted classical moldings are used to form these members. The shaft may have plain sides or panels; the top often terminates in a finial such as a vase, urn, ball or pineapple.

Next the rails are developed by having moldings and the pickets become square balusters or are even turned on a lathe. The whole fence then becomes purely architectural and is treated in the same way,



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both as to design and construction as any other architectural feature. As this type is formal to the last degree, it is better used in close proximity to the house, or if in the garden it should have some relation to the main features, such as casinos, pergolas, retaining walls and the like.

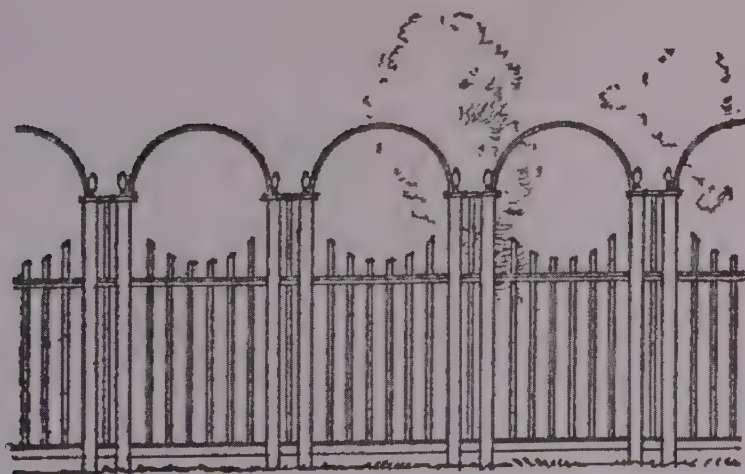
Some of the best modern English and German wood fences are as good as any done before them. Whether acting as fences in the usual form or as screens, arbors or backgrounds for planting, they are most appropriate for their setting and never seem out of place or style. (Figs. 4 and 5.)

The more complicated the fence is in design, the more complicated it is in construction. This is self evident. The more parts, the more care necessary in connecting them and the larger the parts, the more members to be assembled.

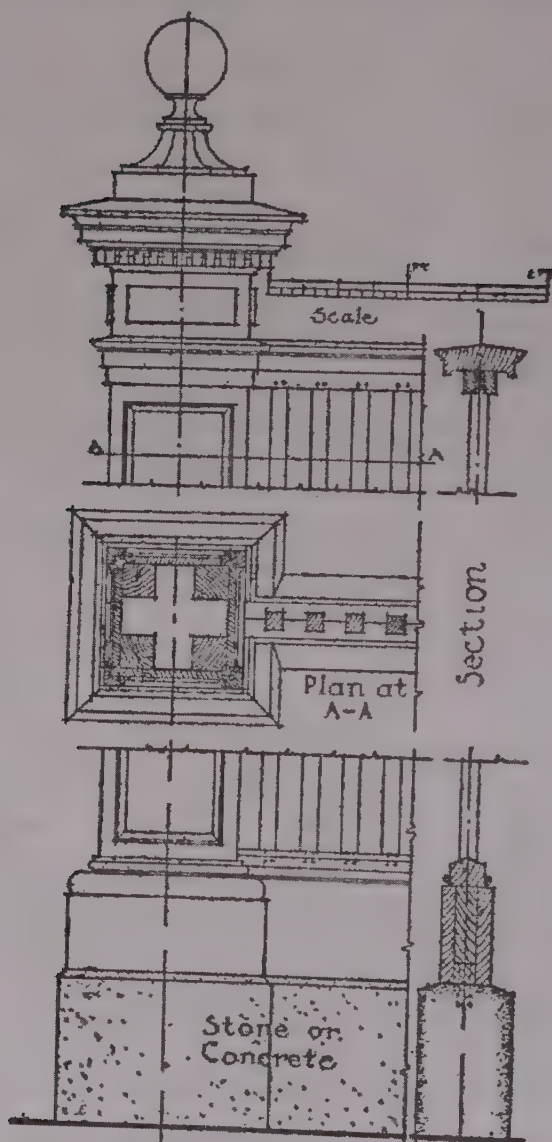
When a post becomes over five inches square and has panels and molding it is built up of different pieces, which should be, if possible, tongued and grooved into one another and have the joints set in white lead. Hard wood



Lattice fences are particularly effective as a background for planting



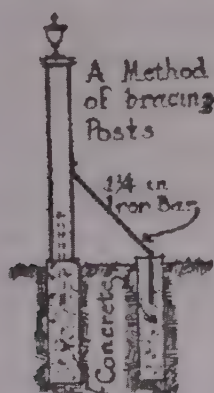
Such English and German designs of wood fences as this are particularly effective



The fence post over five inches square needs to be carefully constructed of different pieces. This plan shows good construction

splines are an additional security at mitres to keep them from opening up. Rails if over 4 x 4 inches should also be built up. Clear white pine is by all odds, the best wood for exterior work not in contact with the ground. But it is expensive. Cypress and cedar are used and in the West, redwood. (Fig. 6.)

Fences of any height should be well braced. To brace lengthwise is compara-



tively simple but get a brace at right angles to the fence is not usually possible and it is apt to look ugly and to take up space that interferes with other features. (Fig. 7.) It is therefore quite necessary to thoroughly secure the uprights in the ground. Bracing is important near gate-

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ways as at these places a greater strain is borne.

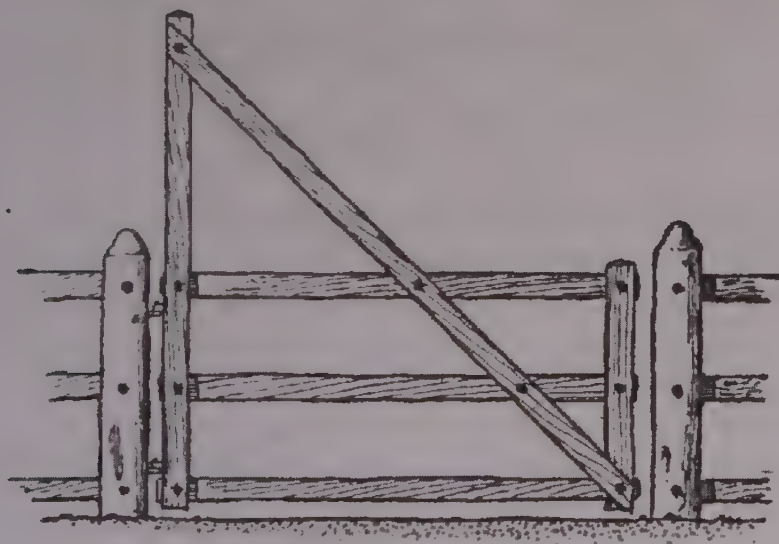
### GATES

The gates themselves should be especially strong and the construction here is more elaborate, as frequently the gate is the principal feature of the whole. It is the point of interest of the general design. The braces are to be worked in as part of the composition. They should not look like independent members, but should tie in with the general arrangement. Equal size rectangular parts intersecting may be halved together, although care must be taken not to weaken a structural part. Corner gates are bad for they put an uneven strain on the fence.

Remember that a gate acts as a lever and exerts a strain on its support proportionate to its length. In wide gates various devices are resorted to to establish an equilibrium so that all the weight is not borne by the lower hinge or fastening. Braces and balances serve for this purpose. The braced gate is shown in Fig. 8, the brace being kept low enough not to mar



the appearance or to produce a clumsy effect. The balanced gate is structurally better for it can be made to be absolutely counter-balanced and divide the load equally. The weight is generally a box



A simple type of braced gate easily constructed

filled with stone and the member holding it may be a section of a tree trunk which is pivoted on the top of the post to which the gate is hinged. (See Fig. 9.)

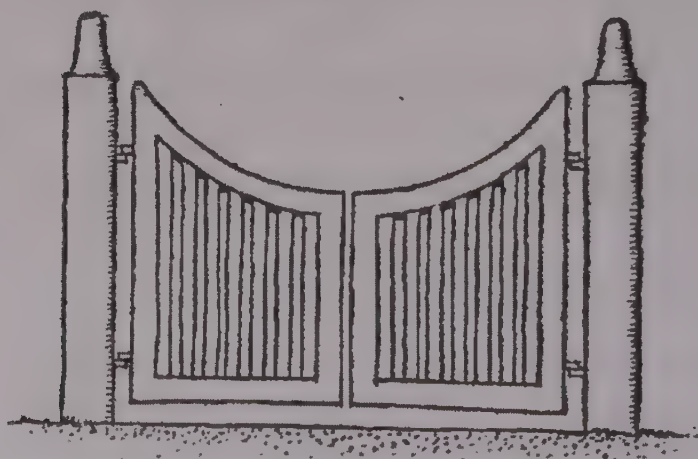
If the braced and balanced gates are not appropriate for your fence, ones with concave tops may be substituted as they work

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A box filled with stones is a common means of balancing the weight of a wide gate

on the same principle as those that are braced. (See Fig. 10.)



A concave top is a substitute for bracing that is attractive in appearance

Gate hinges may be cast or wrought iron strap hinges for the informal gates and

regular pin butts for elaborate ones. A latch should be provided either of wood, to be old fashioned, or of iron. Turnstiles are quaint adjuncts to fences in old time gardens. They are seen more in England than here but are often useful in connection with a large gateway for vehicles.

#### WIRE FENCES

I dare say for general utility and length of service the wire fence with iron posts gives the best results for the amount of money expended. They are quickly erected and need but a few repairs. However, the possibilities, artistically, are limited. The posts are set in iron anchors which require little digging and spiral wires, with a flat cross section, are run between. The greatest objection to this fence is that it is easily climbed and consequently, not only allows the ingress of intruders, but causes the wires to be broken or pulled out from the fastenings at the post, which consist of wire elliptical rings passing around the horizontal wire and through a hole in the flange of the post,

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whose cross section is in the form of a T. To avoid climbing barb wire and high non-climbing mesh are used.

Another serviceable form of wire fence, but one utterly devoid of decorative qualities, is composed of concrete posts and horizontal wires. The posts are molded with holes for the wires to pass through and are reenforced with steel rods. Railroads use this extensively along their right-of-ways. Instead of the holes in the posts, staples may be set in the concrete before it sets and the wires passed through these. If a wire mesh is used instead of horizontal wires some interest may be effected by the weaving of the wire or by the proportioning of the meshes.

The best wire for a fence is one that is of hard steel but not of spring steel grade. It should be able to stand considerable abuse and hard wear yet at the same time be easily spliced. Top and bottom wires to hold fabric between are best of carbon steel.

### IRON FENCES

The all iron fence, whether cast or wrought is an expensive proposition com-





An early 19th century American iron fence set on a stone base course.





pared with the fences previously discussed. Iron fences are usually elaborate and require special molds and castings if an original design is used, but many fairly good designs are supplied from stock by the manufacturers and these, of course, are cheaper than the ones specially prepared. Iron in connection with brick or stone is effective. The color of wrought or cast iron with masonry is always pleasing. Masonry piers with iron between is a common form. Take care, however, that if the design of the iron work is formal the pier should be formal and vice versa. Wrought iron has a better texture and color than cast iron but costs more.

In general iron and wire fences should have their posts so secured that they may not be lifted from the ground by frost. If the iron is set in concrete bases it is liable to rust quicker. Use cast iron anchor bases and select a fence that can be put together by ordinary tools.

The best manufacturers' catalogues give excellent information about iron and wire fences and show diagrams for their setting and assembling.

## TREILLAGE

Let us say a few words for trellis-work inasmuch as it is a first cousin to the fence. I do not speak of the ordinary lattice which clings to walls, rears itself between porch columns or spreads over rear doorways and out buildings. Rather do I mean the putting together of posts, rails and other delicate wood members, including the above lattice, to form a distinct architectural design which may serve for various purposes such as statue niches, summer houses, arbors or supports to pergolas and screens.

One of the first requisites in the designing is that the framework while being strong must, at the same time, carry out gracefully the lines of the structure. Angles may be strengthened by iron stays. If not securely fastened heavier wood must be used which would probably injure the effect of the design. The frame forms the organic lines of the pattern. For the filling in do not have too many curved lines but depend upon these to accentuate a point of interest, such as an

oval in the center of a square or rectangular space. (See Fig. 11.) The pieces as they meet, for strength's sake are not halved together but are let over one another. The better effect is when from the side usually viewed the vertical



A treillage fence is graceful, but its framework must be strong and few curves used

members are seen to pass over the horizontal ones. Secure these by nails or wooden pins. For trellis work the English use oak, teak and other hard woods, but we here, shall probably be obliged to employ the same woods as for our fences.

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Since "treillage" requires the best of carpenter work it would be wise to confide the designing to one accustomed to using architectural forms and the making to one who is used to carrying them out.



## II WALLS

### STONE WALLS

**T**HE original wall was of stones gathered from the surrounding land and piled unevenly to form a barrier. This is a dry wall and even to-day there are more dry stone walls than any other kind.

A dry wall is the easiest of the masonry walls to build. Large flat stones are selected for the base and are laid somewhat below grade. On these come the regular wall stones. Select stones that have a natural bearing surface, for of course the more rounded the stones are, the more liable they are to roll down or become dislodged. The quickest wall to build is where no special regard is given to regularity or to height; consequently great care is unnecessary in choosing the stones or fitting them to their places. A better

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wall is obtained when a fairly true surface is kept and the stones fitted to their places even if it is necessary to break some pieces or trim them with a stone hammer. If the stones come in lengths greater than their depths, or are fairly rectangular a more pleasing appearance is the result. This is true of any stone wall for the impression is one of permanency, while rounded stones, especially cobbles, give the feeling that they may at any moment roll from their places and in truth they would in many cases, if it were not for mortar holding them together. The spaces between the large stones are filled with smaller ones, but it is best to keep those more for the interior of the wall than for the outer faces. It is not well to make a dry wall less than two feet in thickness. This at the top, for a small batter or inclination toward the center helps the stability. This thickness is for a wall of 3 ft. or less in height. For every 6 in. additional height the width should be increased 4 in. All stones of a strata character should by all means be laid on their natural beds. They are not then so liable to



A dry stone wall showing the stones laid on their natural bed and having their horizontal dimensions much in excess of their vertical dimensions; a good characteristic.



scale. The famous, or infamous brown stone fronts of New York are good examples of this for the stone was set opposite to its natural bed in the quarry and the consequence is that all over town you will see the brown stone scaling away. The reason that the masons laid them as they did was to secure a surface that would take a smoother finish.

The top of a dry wall may be finished level, with the stones as they come or have a coping. The coping can be of broad flat stones laid dry covering the entire width of the top or they may be set in cement mortar, the interstices being well slushed up with the mortar.

The neatest example of a dry stone wall to the author's knowledge borders the line of the new Catskill aqueduct not far from New York City. The stones have been split in long lengths and have been carefully fitted. The faces are true with no projecting stones and the spaces between the larger stones are filled with smaller ones, which almost exactly fit their position. The coping is of rough cut stone in long slabs covering the entire width and



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these slabs are held together by cement mortar.

The life of any stone wall or pier is increased if it is carried below the frost line which should be from 3 to 4 feet. But this is too expensive in proportion to the cost of a dry wall. In a wall of cut stone laid up in mortar it is more necessary as any settlement or heaving will show cracks in a wall of this character.

The texture of the rough, natural surfaces of the stones in a dry wall gives it its principal charm. Stones selected with a covering of moss, stones having variations of color and occasionally a huge rock taking up the space of several smaller ones, add to the wall's interest. Place these large rocks at the bottom. They give stability.

The final effect of a stone wall depends much upon the arrangement of the stones; the proportion of large to small ones. If the stones are of all the same or nearly the same size the result is sure to be monotonous. Have plenty of long stones. Get a vertical feeling occasionally by putting in a few stones that are considerably

higher than they are wide. See that the stones are carefully fitted to their position.

A wall set in cement mortar is naturally more permanent. Each stone is then held firmly to its neighbor and the whole becomes almost a monolith. Especially is this true when all crevices are well filled up with the mortar. There are several ways in which a wall of this kind may be laid up. The joints between the stones are often filled with the mortar flush to the outer surfaces of the stones. By this method truer and more even faces are secured. Sometimes the joints are raked out. That is the mortar does not come out to the surface but stops anywhere from one half to two inches back. If it is carried in deep enough the effect of a dry wall is the result. In a very thick wall, say three feet or over, mortar is only necessary in the center and this also has the appearance of a dry wall. The method of laying is determined largely upon the nature of the stones and kind of surface wished for. If the stones have rounding faces, it is a saving in mortar not to make a flush finish for

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as some stones are bound to project beyond others it would be necessary to bring the mortar to the outer faces of these. But this would probably cover up many of the stones that did not project. However some charming walls have been built where about 50% of the surface showed stone and the other half was cement. The appearance here and there of a stone contrasting with the cement makes an interesting color effect.

This brings us to the question of color, an extremely important consideration in any wall. Most field stones are gray in color which if assembled together without some relief would prove uninteresting. To avoid this, search for stones that are either darker or lighter than the general run and by placing them judiciously the needed sparkle and contrast is acquired. If the joints are not so deep but that the mortar shows, then another chance for contrast is obtained. If the mortar should happen to be, when dry, the same or nearly the same color as the stone it may be lightened by adding a small percentage of lime putty, not over 10%, or

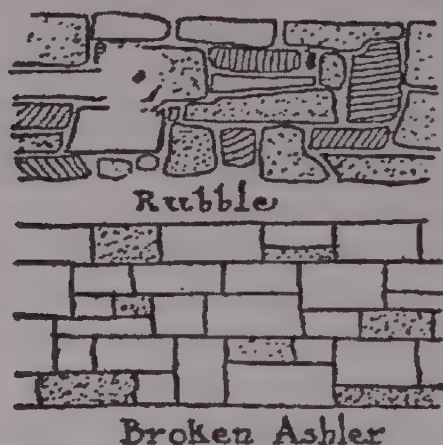
a white cement can be substituted for the gray. In any case use a Portland cement. To produce a black or dark gray joint, mix lamp black with the mortar. Experimenting with a small amount will give you the proportion. A beautiful wall, very light in color, has been obtained by using enough mortar to make a flush or very nearly flush wall and then washing the entire surface with a rather thin mixture of white cement and sand. To get a color even lighter, white sand is used instead of ordinary sand.

In masonry terminology, the walls described above would be called rubble. (See Fig. 12.) Rubble is the simplest and least formal type; the stones are irregular in all dimensions and are laid up as they come with as little breaking and splitting as possible. If the stones are laid in courses the wall is designated as "coursed rubble." After rubble comes random ashlar. Technically an ashlar is a veneer of stone that is used to cover and give finish to a rougher wall behind. This backing wall may be of rubble or of brick. A "broken ashlar" is where the stones, while

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having the exposed faces dressed and trued, are of unequal sizes, though rectangular in shape. (See Fig. 12.) "Coursed ashlar" is where any course is of the same height for its entire length.

A wall of this kind is a big step toward the formal. It is much more expensive to



Two methods of laying  
stone for fences

build over the rubble wall and takes more skill in the building.

A long wall may not only be strengthened but interest added thereto if piers or buttresses are employed. No specific directions can be given for the





A rubble wall laid up in cement mortar with flush joints and surfaces. The wall is in character with the house beyond.



shape, size or spacing of these features for they depend entirely upon the use of the wall, its position, height, etc. The general principles of proportion apply as in all other matters of design.

The height of formality in a stone wall is where the stone is cut and laid exactly as for the walls of a building. That is to say, they may be dressed with any of the surfaces familiar to the stone mason; the joints may be narrow or rusticated; architectural forms may be used and the specifications for such walls would read the same as for the walls of any stone building.

#### WALL GARDENS

An unusual variety of wall is one where planting is done directly upon the wall itself. This is called a Wall Garden.

The wall in this case is more or less informal and is laid up dry and the crevices are packed with soil for the nourishment of the plants. The stones in the wall are so set that they will drain off all superfluous water. The best wall for this purpose is a retaining wall, not over five feet

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in height. A retaining wall having solid earth on one side affords better advantages for the growing of plants than one where each side is a "garden," for naturally in the latter case, the storage space for plant food is limited. Better results are obtained when the face of the wall slopes back from the perpendicular.

Further details of a Wall Garden and directions for planting, etc., may be found in another book of this series entitled "Making a Rock Garden" by H. S. Adams.

### BRICK WALLS

Perhaps there is no building material better than good, hard burned bricks. They have had the test of time such as no other material made by man has had. They have wonderful variation of color, a pleasing range of surface textures and when laid up in cement mortar a permanency that not even stone can exceed. Coming in regular sizes, a wall of them may be of any thickness provided the dimension is a multiple of four, the depth in inches of the average brick.

The thinnest possible wall of brick is four inches, one brick deep. (See Fig. 13.) This, if built straight, would have little strength laterally and therefore a four inch wall is run zig-zag like a snake fence or broken up into short runs by other methods. If each run is not too long and the height is low, say not over five feet, a fairly strong wall is constructed. The serpentine fence at the Uni-



The zigzag brick wall can be built one brick deep. Less space is used if piers are placed at intervals

versity of Virginia, designed by Thomas Jefferson, is an interesting example. This zig-zagging however takes up ground space so strength may be secured by using piers at 6 to 10 foot intervals. If carried below the frost line greater safety is the result, for a wall so thin has little weight and is easily heaved out of place.

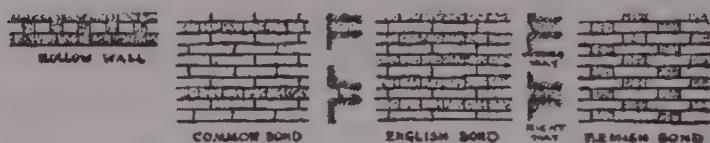
Some walls are built with two thicknesses of brick and an air space between. (See Fig. 14.) The two shells are held



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together with bonds which may be brick laid the long-ways across or may be of metal, special metal bonds coming for this purpose. Hollow walls on account of the air space retain heat longer than solid walls while they require 25% less brick than the latter.

If we find that a wall, for its length, height and position, should require twelve inches of thickness, it would not always



The commonest methods of bricklaying and finishing the mortar joints. At the left is a section of a properly built hollow wall

be necessary to make the entire length so deep. By putting in piers at say eight or ten foot intervals and making them sixteen inches or more square, the wall could be reduced to eight inches. These piers stiffen the wall, act as buttresses and help give lateral strength. If the piers are of great height, ten feet or over, a bond stone, which is a stone four or more inches thick running through the entire pier, helps tie



A straightforward brick wall. Some of the joints are raked and some are flush. The top course of brick is laid with headers on end and covered with cement.



the whole together, this bond stone may be placed as near the center of the pier as the design will permit.

The top of a brick wall is capped with stone, terra-cotta, cement or brick set on edge. The stone and terra-cotta coping are more lasting. The old expedient to exclude trespassers, of imbedding broken glass and bottles in cement, is still occasionally seen.

Like stone the brick should be set in Portland cement mortar and the same directions for color apply as above. The joints can be flush or raked out.

The method of placing the bricks in the wall is called the bonding. The usual forms are common or American bond, English bond and Flemish bond. (See Fig 14.) The illustrations show the varieties and also that through bricks at intervals are necessary to the strength. The common bond takes less brick than the other two as only every sixth or seventh course is laid headers. The headers are the ends of the bricks exposed while the stretchers are bricks laid the long or natural way.

Wonderful decorative effects are pro-

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duced by the bonding and by various methods of placing the bricks in the wall. Bricks placed on edge, flatwise, laid herring bone and with continuous joints are some of the ways to procure these effects.

### WALLS OF TWO OR MORE MATERIALS

When we come to consider walls of two or more materials we have a wealth of designs and combinations. There are stone and brick, stone and wood, iron and stone or iron and brick. Where wood or iron is used with brick or stone, the former are employed usually as fillers in between brick or stone pieces and these would be spaced the same distances apart as the posts in wood or iron fences. A fence of wood running between stone or brick piers offers a style that combines the appearance of masonry with the comparative cheapness of a wood fence. And what charming designs are possible with this union! The white of the painted wood and the gray of the stone make a color scheme that goes gloriously with flowers or lawn, reflects itself in a pool or stands out grace-



fully from a background of shrubbery or evergreens and fits into an old fashioned garden like the hole in the doughnut, which, you will admit is a perfect fit.

Brick and iron go particularly well together. Not only is this true as regards color but they seem to have a certain affinity of texture which is harmonious and satisfying.

In all designs architectural, and walls of masonry are to be considered as architecture, whether part of a building or free-standing, there is a factor that is highly important to the success of the design. It is the subtle relation of surface to surface, texture to texture. This relation is quite independent of form and also of color in as far as color does not affect texture.

Let us keep this in mind in combining our materials for our walls and fences. If stone and wood are to be used, we shall not have our stone piers, with rough undressed faces, rugged and bold, keeping guard over a slender, delicate and formal screen work of wood between. Rather should we have stout palings, that are per-

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chance allowed to weather or at the most receiving a stain more as a preservative than as a finishing surface. But as we smooth down our piers ; set the stones more regularly, our wood becomes more formal and perhaps playful and the surfaces smoother and the angles sharply cut.

In the most trivial of building operations as in the mightiest, the foundations are the first and one of the most important considerations.

Very few walls are heavy enough of themselves to cause the earth beneath to give way or to be pushed out of place. Even the poorest soils will bear from three-quarters to a ton of superimposed weight to the square foot. By this is meant natural soils, for of course, some kinds of made land have little or no bearing power, also quick-sands. If your wall is to be so heavy that you fear for its stability in consequence of poor ground, then by all means call in an expert and take no chances. While the wall may be in little danger of settling from its own weight yet such conditions might arise whereby the

earth beneath is taken away, as by water, and the wall just “naturally” drops. An open tile pipe beneath the wall, if given a pitch, helps to carry away moisture. But this pipe must be able to lead somewhere away from the wall and empty or else it will become merely a cistern and



The solid retaining wall needs a drain at the bottom. Here are two satisfactory methods of laying drain tiles

hold the water instead of discharging it. If the wall is a retaining wall it is doubly important that no water collects near the bottom. The illustration shows the method for draining this type of wall. (See Fig. 15.)

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In place of the pipe a course of dry stones, which allow water to percolate through them, may be substituted. The bottom of all permanent masonry walls should extend below the frost line, which will be from three to four feet below grade, the farther north we are the deeper we go, but four feet will be the maximum.

To join wood and stone it is well to have as little wood as possible imbedded in the stone work on account of liability to rot. This is more true of vertical pieces of wood than horizontal ones, as they collect water at the joints more readily. Iron dowels and anchors are safe and strong means of fastening. If iron is used with stone it may be built into the stone work or a hole drilled, the iron inserted and the hole plugged with molten lead. With brick it is better to build in the iron. If balusters are brought down on stone or concrete they are more lasting if held a small fraction of an inch above the stone by an iron dowel, for the water cannot then collect around the base and rot the wood.

## CONCRETE

Concrete combines well with stone, brick, wood or iron. Its simplest use is for the posts of a wood or iron fence; we have already spoken of the wire fence with concrete. To elaborate, the spaces between the posts may be filled in with a solid concrete wall and furthermore brick and stone may be employed with the concrete for this purpose.

One advantage of concrete is that the average person may in a short time learn to mix and set it. But don't persuade yourself that concrete is an easy material to handle. In the first place it is heavy, weighing some 135 pounds per cubic foot; it must be mixed thoroughly, which takes hard manual labor, and besides it dirties up, while wet, everything with which it comes in contact. It would be wise before starting work to procure a good hand book on concrete which gives careful directions as to mixing, etc. As directions have been given in so many articles and books concerning the methods of con-



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crete making, it is not necessary to repeat them here.

To vary the color and texture, employ different kinds of sand and cement. A white Portland cement with white sand gives a very light wall, almost white, but the difficulty is that white sand which is usually from the beach is not sharp and consequently not as strong. Yellow sand with gray cement make a brown or brownish gray wall and gray sand and gray cement give a decided gray when set. As wood forms are used to hold the concrete until hard, the surface and joints of the boards are left imprinted upon the surface of the concrete. To avoid this, take down the forms before the set is too hard and scrape with a stiff wire brush. Pebbles mixed in with sand and cement show an interesting surface texture after scraping.

While concrete has great crushing strength and is able to resist great weights placed upon it, in comparison it has little tensile strength. It is well therefore to provide this tensile strength by some other material. Steel rods are usually employed



A good concrete wall. The surface texture is interesting for the concrete has not been touched after removing the wood forms. The lines of the boards are quite visible.



for this. They are placed where the tensile stress occurs. If a load is applied to a concrete beam, the tendency to bend causes the molecules in the upper part of the beam to be compressed and those in the lower part to be pulled asunder. The steel rod or rods placed below the center, by their great tensile qualities, supply the needed strength. Posts should have two rods, placed vertically in diagonal corners and walls can have either rods placed vertically or a steel mesh running lengthwise with the wall. If a wall is thick and not high in proportion to its width this re-enforcing is not necessary. Expansion joints should be left in all continuous walls and precise information about these is obtained from the hand books.

#### COST

It is difficult to lay down definite figures for the cost of building walls and fences. Material and labor vary from year to year and from place to place. Therefore what follows should be regarded as only approximate although every precaution has been taken to be accurate.

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Starting with fences, the simple forms of picket fences cost in the section of New York about \$2.00 to \$5.00 per running yard. New England and the South could build them cheaper, say for 75 cents up per yard, due in the former section to cheaper labor and in some parts cheaper material, and in the latter section (the South) to both cheaper labor and material. The West in general is cheaper than New York, especially in the lumber regions. These figures are for fences of considerable length and not for short runs.

As the fence becomes more complicated in design the labor cost increases in a greater ratio than the material cost and the only exact way to determine these is to get an estimate from a carpenter. It would be necessary to have drawings of the fence to get accurate figures.

For wire and iron fences the safest way is to go directly to the manufacturers for their figures. Their catalogues give prices and other information.

A fence 3 feet high of three wires strung between locust or chestnut posts costs from 90 cents to \$1.00 per running yard.



A fence five feet high cost \$1.15 per running yard. If you have the posts growing, then outside of buying the wire and the staples the cost consists of cutting and setting. A man can drive 90 posts in a day under ordinary conditions and he can dig 30 holes. A man can drive from 25 to 200 iron posts in a day, depending on the soil.

In rough masonry work we figure by the perch of  $16\frac{1}{2}$  cubic feet. For a rough dry wall a good average would be \$4.00 the perch while for one laid up at random in cement mortar a perch would be worth about \$5.00. Copings 4 x 21 inches if rock face edges and tops, cost from \$ .50 per lineal foot up; if clean cut \$1.00 or more. These figures are for stone at hand, if carting is necessary the price goes up in proportion to the distance hauled. Walls of common brick handburned with ordinary bonds cost from \$12.00 to \$15.00 per thousand bricks. There are 15 bricks to a square foot of 8-inch wall,  $22\frac{1}{2}$  bricks to a square foot of 12-inch wall, 30 bricks to a square foot of 16-inch wall, and  $7\frac{1}{2}$  bricks for each additional thick-

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ness of wall. Face brick such as washed, wire cut and tapestry brick bring the price up 50 per cent. or more. Cut stone walls can only be fixed by estimates when drawings and specifications are supplied. Concrete mixed by hand in most sections runs from \$6.00 to \$10.00 per cubic yard. Remember in figuring the cubical contents of a wall to include what is below grade as well as what is above.

### III

## HEDGES

**H**EDGES are capable of fitting any scheme of planning and combine with the beautiful some of the most excellent of practical features. These "live fences" with the colors of nature have a limitless range of shapes and sizes.

If dense, the hedge not only obstructs the vision of the outsider but acts as a windbreak. If less thick it still screens, but at the same time allows a certain amount of air to pass through. With the average wall or fence, once in place, a change is not easy. Not so with the hedge. It may be varied from year to year, now thick, now thin, now high, now low, until just the right shape and density are acquired. It improves with time.

With hedges you have wonderful backgrounds for garden accessories, long lines of bright color if needed or screens to ob-

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jectionable features. They may be links between the formal and the purely natural and mark a dividing line with softness but decision.

Yet even such a glorious creature as a hedge has *some* disadvantages. It just welcomes all sorts of woody and creepy vines, among which the poison-ivy is a leader. The only successful way out, is to remove these intruders by hand when they are small, or otherwise the task will become a titanic one. Then there are the insects, but these can be treated with the same methods and amount of work as for shrubs and trees. Cultivation is often necessary and makes another act of labor with pruning and spraying. Yes, a hedge must have care while a brick or stone wall once in place needs little further attention.

Do not get the idea that hedge growing is a life long affair. It is true that box and a few other varieties are very slow growing but privet and laurel makes in two or three years a very respectable appearance and the majority of others very little longer.

## PLANTING

*General Directions.* Before planting is started the soil must be properly prepared. First thoroughly plow a width of six feet and the length of the hedge and then cultivate. Better results are certain when fertilizers are used and the area cropped the year previous, especially if the soil is poor or impoverished. A trench or furrow is run through the center of the cultivated strip deep enough to take the roots without bending, and after setting growth is hastened by making the soil firm with a rammer.

The young plants must be shortened both top and root before planting and must not be too old or large. It is true that in transplanting hedge plants as well as fruit trees the shock of transplanting retards the growth when too far developed so that a younger plant, which has not gone far enough to be shocked, will overtake and pass its older rival in a few years. Two or three years old is about the right age. A young hedge often has a wire fence down the center as a reenforcing un-



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til it is strong enough to stand by itself in the world.

A good general rule for the spacing of the new plants is to have the distance between two-thirds the height of the plants. If you wish to have eventually a high hedge, plant farther apart than for a low hedge. To help increase the height from the beginning plant on a low raised bank whose flat top should be at least two feet wide. Let this bank have turf.

Plant in single lines for formal effects and in double lines, the plants alternating, for protection and shelter.

Where a hedge is used as a background for flowers a distance of two feet may well be kept between the hedge and the flowers as the roots of the former would rob the latter of much of their nourishment.

### PRUNING

All deciduous growths may be pruned at any time in the south, while in the north mild weather in February and March is selected by many gardeners for this work.

The plants develop buds along the branches and when part of a branch is cut



Arborvitæ hedge. For dense, thick barriers this variety is unexcelled.



away the future growth is concentrated in the remaining buds which improves the shape and the health of the plant. But good judgment is essential for this pruning. Different plants require different cuttings and the final shape desired has much to do with where the cuts are to be made. To secure a bushy effect, cut back the ends of branches. To get long vertical branches cut away those branches which are not vertical or which interfere with those that are. As a rule make the cut just above and quite close to, a bud. This will leave little wood projecting beyond after the bud has started growing. Generally flowering hedges look best with rounded outlines. Do not be afraid to prune enough; most beginners are. Shrub hedges require pruning while evergreen hedges are generally clipped with shears.

Remember that flowering shrubs produce their flowers in two ways — one class from buds formed the previous season and another class from buds appearing on the wood the same season with the flowers. Some of the first class are lilacs, honeysuckles, privets, dogwood, Japan, quince,

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azaleas, mock oranges and dwarf horse-chestnuts. If these are pruned in the early spring all buds cut away are flowers lost. The best way is to prune severely every three or four years and regulate yearly as much as possible by late spring cutting. With the second class pruning may be as close as you wish in the early spring or late winter for many varieties will flower all the better if closely cut back.

Honey locust and osage orange may be allowed to grow until they are an inch through near the ground and then cutting them back almost to the ground. A strong new growth is the result and afterwards they may be trimmed yearly as for other hedges.

Evergreens are best pruned in April. By being clipped each year they become very dense which is especially desirable for the Norway spruce as it becomes very open if allowed to grow. Most pines are not happy when pruned, the white pine being more tractable than the others; although if their natural forms of growth are carefully considered much can be done with them.



Cut back to some strong bud and as a rule do not go back further than last year's growth. Most hedges if left unclipt for several years are ruined beyond remedy.

## VARIETIES

We usually think of hedges as being evergreen, box or privet, but in truth the majority of hardy shrubs and some trees make excellent hedges.

We shall divide the varieties into Deciduous and Evergreen. Following is a list of the better known flowering deciduous kinds: —

Japanese Barberry (*Berberis Thunbergii*).

Holly-leaved Barberry (*Berberis aquifolium*).

Cockspur Thorn (*Cratægus Crus-galli*).

Rose of Sharon, variety of (*Hibiscus Syriacus*, *Carneaplena*).

Osage Orange (*Maclura aurantiaca*).

Honey locust (*Gleditschia Triacanthos*).

European Hawthorne (*Cratoegus Oxyacantha*).

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Buckthorn (*Rhamnus Catharticus*).

Lilac (*Syringa Vulgaris*).

Sweetbrier Rose.

Hydrangea (*Hydrangea paniculata*).

### EVERGREENS

Norway Spruce (*Picea excelsa*).

American arbor vitae (*Thuja occidentalis*).

Common Hemlock (*Tsuga Canadensis*).

Junipers (*Juniperus communis*).

Box.

### EVERGREEN (*Southern*)

Flex cassine.

Holly as far north as New Jersey.

Privet in a way is both deciduous and evergreen.

### SMALL LAWN HEDGES (*Northern*)

Honeysuckle.

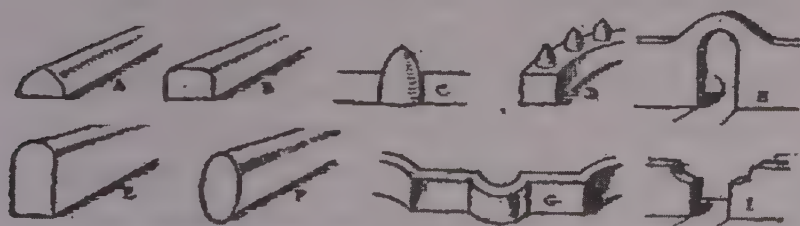
Lilac.

Redbarked dogwood.

### SOUTHERN

Chinese Privet; cape jasmine; Japan evergreen; roses.

*The Japanese Barberry* grows four feet high in a great variety of soils and will stand the shade. It is hardy everywhere with many twigs and thorns and if clipt makes a dense and solid wall. It has bright scarlet berries which last through the winter. If the plants are sheared, set



The various forms of hedge trimming shown in section and perspective

them 18 inches apart; if not, 24 to 30 inches.

*The Holly-leaved Barberry* stands to a height of four feet and like the above grows in any soil. Has good winter color and blossoms in May with yellow flowers. Set plants as for above.

*The Cockspur Thorn* will go up to twenty-five feet and while it will grow in most any soil prefers a rich one. Blossoms in May and June with clusters of white flowers something like apple blos-

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soms. Has long, sharp thorns. Set plants 24 to 30 inches apart and prune not later than August first.

*Variety of Rose of Sharon.* Grows twelve feet high in any soil. The bush is covered with single pink flowers in August and September. Set plants 18 to 24 inches apart and prune after flowering.

*Osage Orange.* This is really a tree but adapts itself wonderfully to a hedge. Is spreading and picturesque with handsome orange-like foliage. Will not stand the climate of our extreme northern states.

*Honey Locust.* Small globe-headed tree with elegant foliage. With proper shearing makes an excellent hedge.

*European Hawthorn.* Not recommended for United States as it has many fungus enemies here. The varieties are arbutus-leaved, apple-leaved, pear-leaved, glossy-leaved, parsley-leaved and many others. They are of compact growth and will stand any soil and situation. The flowers are abundant and plentiful.

*Buckthorn* has small dark leaves and inconspicuous greenish white flowers. Makes a good hedge.

*Lilac.* Flowers purple and white. There are several varieties having different colors in the flowers and leaves. Some varieties assume a tree like form.

*Hydrangea.* It is hardy throughout the country and very vigorous in growth. The flowering is extremely gorgeous with large pyramidal panicles of white flowers that change to pink and last well into the winter. The plant enjoys a deep rich soil and moisture.

*Norway Spruce.* This tree is very hardy and of free growth. It is well to control it by clipping as it appears coarse when grown too high. There are many valuable varieties that vary in color and all make fine hedges. Some grow into pyramidal and conical forms naturally and there are dwarf species.

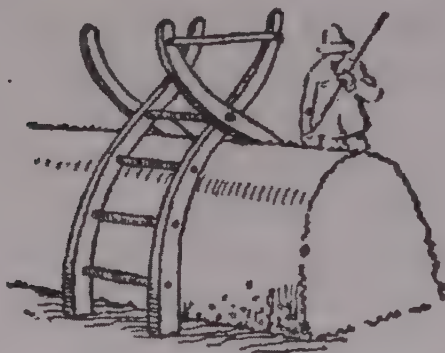
*Arbor Vitæ* is hardy with rapid growth when conditions are favorable. Assumes conical forms. Varieties range from somber colors to golden and silver-hued ones. Fine for contrasts. There are also dwarfs of this family valuable for edgings or low hedges.

*Junipers.* These are beautiful and re-



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liable hardy evergreens and have a great range of adaptability, size and form.



A stile useful for crossing a hedge. May be folded up and removed.

THE END




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